USDA Forest Service
Region 10

Evaluating the Demand for Tongass Timber

Using Adaptive Management to Implement Sec. 101 of the 1990 Tongass Timber Reform Act

Kathleen S. Morse
Regional Economist
September 28, 1998

Preface

Section 101 of the Tongass Timber Reform Act amended the Alaska National Interest Lands Conservation Act (ANILCA; P.L. 96-487) by deleting the following provision:

> *Sec. 705. (a) The Congress authorizes and directs that the Secretary of the Treasury shall make available to the Secretary of Agriculture the sum of at least $40,000,000 annually or as much as the Secretary of Agriculture finds is necessary to maintain the timber supply from the Tongass National Forest to dependent industry at a rate of four billion five hundred million board feet measure per decade. Such sums will be drawn from receipts from oil, gas, timber, coal, and other natural resources collected by the Secretary of Agriculture and the Secretary of the Interior notwithstanding any other law providing for the distribution of such receipts: Provided, That such funds shall not be subject to deferral or recession under the Budget Impoundment and Control Act of 1974, and such funds shall not be subject to annual appropriation.*

and inserting:

> *Sec. 705. (a) Subject to appropriations, other applicable law, and the requirements of the National Forest Management Act (P.L. 94-588); except as provided in subsection 9d) of this section, the Secretary shall, to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle.*

It is likely that the authors of this legislation visualized "meeting market demand" in the classic sense of a supply curve meeting a demand curve to define an optimal, or equilibrium level of timber output from the forest. Unfortunately, the situation cannot be summarized so neatly. The timber industry in Southeast Alaska is in the midst of a complete structural change and the data required to build a formal economic model of demand are limited. Moreover, it is a well-established economic principle that in highly concentrated markets—such as the Southeast Alaska stumpage market—prices and quantities are indeterminate in terms of formal supply and demand curves[1].

Seeking to meet the market demand for timber under these conditions requires a great deal of professional judgement, along with a commitment to monitor key parameters of the emerging timber market and to incorporate this information in timber sale planning. The following pages document the rationale used to set short-term goals for the Tongass timber sale program and to establish a framework for systematically collecting, evaluating and incorporating the information needed to refine this approach.

[1] The Irland Group, Timber Demand Scenarios for Tongass National Forest 1991-2010, Report to the Alaska Region USDA Forest Service, June 1992, pg. 13.

Table of Contents

List of Tables

Introduction

The Record of Decision (ROD) for the Tongass Land Management Plan Revision states that "the Forest Service will develop procedures to ensure that annual timber sale offerings are consistent with market demand." [2] This paper documents the procedures referenced in the ROD and in doing so, clearly explains the actions taken by the Forest Service to respond to the timber provisions of the Tongass Timber Reform Act. The procedures were designed to ensure that--within the constraints imposed by appropriations, other applicable law, and the allowable sale quantity in the Forest Plan--the size of the Tongass timber program alone does not limit the competitive ability of the industry.

The strategy presented here is designed to accommodate the uncertainty associated with forecasting market conditions in the midst of a complete restructuring of the region's timber industry. It also accounts for the fact that the Forest Service cannot respond quickly to market fluctuations, as it may take several years to prepare timber for offer. Alternatively, by allowing the industry to accumulate an adequate inventory of "volume under contract" (an inventory of uncut volume) the Forest Service can monitor industry behavior and adjust program levels to keep pace with harvest activity.

As described here, the process for evaluating market demand is systematic, logical, and consistent with economic theory. Moreover, the approach extends beyond the basic direction in the Tongass Timber Reform Act to include the monitoring of key economic indicators and regional stumpage market conditions. Information collected by the Pacific Northwest Research Station and the Forest Service Alaska Regional Office will be used to test assumptions about the relationship between the performance of the timber industry, economic conditions, and the Tongass timber sale program. As more knowledge is gained, we may choose to modify our hypotheses, refine our predictive model, and/or change our management strategy. Thus, the approach described here embodies the essence of adaptive management; a continual cycle of hypothesis--feedback--adjustment.

The paper begins with an overview of the historical development of the timber industry in Southeast Alaska and the events preceding the passage of the Tongass Timber Reform Act. This is followed by a review of the timber supply provisions in the Tongass Land Management Plan and the methodology used to quantify the demand for Tongass timber over the planning cycle. The next sections focus on annual timber demand and explain the rationale used to determine the appropriate volume of timber to offer under highly unstable market conditions. Finally, the paper addresses the essential elements of monitoring and evaluation. The monitoring plan describes how a program of data collection and reporting will be used to verify the assumptions made in projecting market demand and to further refine this approach to annual sale planning.

[2] United States Department of Agriculture, Forest Service, Tongass Land Management Plan Revision Record of Decision, R10-MB-338a, May 1997, pg. 37.

Background

Historical Development of the Industry

Established in 1917, the Tongass is the largest National Forest in the United States. Roughly, 85 percent of the land in Southeast Alaska—an area 500 miles long and 100 miles wide—is included within its borders. At the time the National Forest was established, logging activity was primarily directed toward meeting the needs of the resident population and to support expansion of the fishing and mining industries. Local timber supplies were used for fish traps, piling, packing cases, mine timbers, dock piling and timbers, and housing materials.

World War I generated an increase in the demand for Sitka spruce from Alaska for airplane manufacture. By 1920, approximately 20 million board feet (MMBF) of timber was harvested from the Tongass each year, including a large volume of free-use wood for the Alaska Railroad and other entities. Even at this time, mills in the Puget Sound area posed a threat to local processors, as large volumes of Douglas fir lumber were being shipped to Alaska at a competitive price. Eventually, despite relatively high operating costs, the Alaska timber industry was able to increase its stronghold in the State. During the 1930's, local manufacturers supplied 84 percent of Alaska's total wood consumption, a significantly larger percentage than in prior years (estimated at 32 percent).

Logging activity in Southeast Alaska intensified in the 1940's, once again in response to the demand for aircraft parts made from Sitka spruce. After World War II, the collapse of the mining and fishing industries prompted a vigorous effort by the Forest Service to increase the scale and manufacturing capabilities of the region's wood products industry. Wood pulping facilities were targeted to meet the dual objectives of utilizing a vast timber supply and providing stable, year-round employment.

In 1951, after several years of intensive effort to recruit wood-based industry to Southeast Alaska, an agreement was reached with Louisiana Pacific to build and operate the region's first large-scale pulp mill in Ketchikan. As part of the agreement, the company received a fifty-year contract for some 8.5 billion board feet (BBF) of timber from the Tongass National Forest. At the time it was built, the mill cost nearly $52.5 million and represented the single largest industrial investment made in the Territory of Alaska.[3]

A second fifty-year contract for Tongass timber was awarded to Alaska Lumber and Pulp Company, Inc. (ALP) in 1957. As part of this agreement, ALP constructed and operated a pulp mill in Sitka, Alaska. The mill was completed in November 1959 at an approximate cost of $66 million to a Japanese parent firm, Alaska Pulp Company, Ltd. The Sitka pulp mill was the first major foreign investment made by Japan after World War II.

The fifty-year timber contracts represented a commitment by the Forest Service to make a substantial and consistent supply of timber available to the industry. Years later, Congress bolstered this timber supply commitment with Section 705(a) of the Alaska National Interest Lands Conservation Act (ANILCA; P.L. 96-487, Dec. 2, 1980) which read as follows:

[3] Rogers, pg. 78.

> *Sec. 705. (a) The Congress authorizes and directs that the Secretary of the Treasury shall make available to the Secretary of Agriculture the sum of at least $40,000,000 annually or as much as the Secretary of Agriculture finds is necessary to maintain the timber supply from the Tongass National Forest to dependent industry at a rate of four billion five hundred million board feet measure per decade.*

Under ANILCA, Congress attempted to set aside large areas of the Tongass for wilderness while ensuring that employment in the timber industry employment would be maintained. To offset the reduction in timber supply caused by more restrictive land use designations and State and Native land selections, Congress included the Tongass Timber Supply Fund. The purpose of this $40 million annual earmark was to fund pre-roading, cultural treatments, and innovative logging systems to achieve an offer level of 4.5 BBF (billion board feet) per decade. However, the subsequent decline in timber industry employment was testimony to the fact that an ample supply of national forest timber alone could not guarantee prosperity in the region's timber industry. Market conditions and the demand for wood products were equally important.

In the years following the passage of ANILCA, several significant changes took place in Alaska's stumpage markets and international wood product markets. Alaska began losing market share in the Pacific Rim during the 1980's and its foothold in the Japanese market steadily eroded. From 1972 to 1985, Alaska's share of North American softwood lumber exports to Japan dropped from 42 percent to six percent. The volume of lumber exported declined from a high of 340 MMBF to 87 MMBF. The diminished role of Alaska's producers in lumber export markets has been attributed to a coincident drop in Japanese housing starts (along with a decline in the share of wood-based houses) and increasing competition from lumber producers in the Pacific Northwest and British Columbia.[4]

While lumber production steadily decreased in Alaska, the Forest Service continued to offer timber sales consistent with the direction set forth in ANILCA Section 705(a). From 1980-1987, the Forest Service prepared and offered an annual of 467 MMBF of timber each year while the volume sold and harvested averaged 280 MMBF.[5] Witnessing the apparent disparity between supply and demand, an intense debate broke out among interest groups as to whether the 4.5 BBF referenced in ANILCA was intended to be a cut level, an offer level, a ceiling, or a floor.[6] Although the market rebounded in later years, the stage had already been set for Congress to revisit the controversial timber provisions of ANILCA.

In 1990, Congress passed the Tongass Timber Reform Act "to make management of the Tongass consistent with the management of the other 155 forests in the National Forest System.[7]" In doing so, the unique timber supply provisions and fixed appropriations included in Section 705(a) of ANILCA were repealed and replaced with the following more general direction in Section 101:

---

[4] Richard W. Haynes and David J. Brooks, An analysis of the timber situation in Alaska: 1970-2010. Gen. Tech. Rep. PNW-GTR-264. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 1990.

[5] U.S. Department of Agriculture, Forest Service, Alaska Region, "Timber Supply and Demand 1986", April 1987. Figures cited do not include utility-grade volume.

[6] The Irland Group, "Timber Demand Scenarios for Tongass National Forest 1991-2010: Report to Alaska Region USDA Forest Service", June 1992, Appendix, p. 47.

[7] U.S. House of Representatives, "Tongass Timber Reform Act", Report of the House Committee on Interior and Insular Affairs, Rept. 100-600, Part 1, May 4, 1988, p. 4.

> *Sec. 705. (a) Subject to appropriations, other applicable law, and the requirements of the National Forest Management Act (P.L. 94-588); except as provided in subsection 9d) of this section, the Secretary shall, to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle.*

The judicial interpretation of Section 101of the Tongass Timber Reform Act (TTRA) is documented in two court decisions. The Ninth Circuit found in *Alaska Wilderness Recreation and Tourism Ass'n v. Morrison* that "TTRA envisions not an inflexible harvest level, but a balancing of the market, the law, and other uses, including preservation. It thus gives the Forest Service leeway to choose among various site-specific plans, provided it follows the procedural requirements of the applicable statutes." The District Court of Alaska likewise found in *Alaska Forest Association v. United States of America* that "[a]llocating timber for sale is simply one of many factors which the Forest Service is to consider within its discretion in determining whether to make timber in the Tongass available for sale." The court also held that "TTRA's reference to seek to meet market demand was not a mandate. Instead, it was an admonition to be considered together with other goals in establishing a timber plan for the Tongass."

After the Tongass Timber Reform Act was passed, the long-term contracts between the Forest Service and the pulp companies continued to offer some assurance of stability in the supply of timber made available each year. However, a guaranteed timber supply was not enough to ensure the viability of these operations in the face of increasingly competitive markets. In a letter to the Forest Service dated June 30, 1993, the Alaska Pulp Corporation announced its intent to suspend the operation of its Sitka, Alaska pulp mill effective September 30, 1994. The company cited adverse world market pulp conditions, increasing production costs, and a shortfall in the amount of timber available at an affordable price as reasons for the suspension. The pulp mill closure prompted the Regional Forester's decision to terminate APC's long-term timber contract on April 14, 1994.

Almost three years later, the Forest Service terminated the remaining long-term timber contract. In the fall of 1996, the Ketchikan Pulp Company (KPC) announced its intent to close its Ketchikan, Alaska pulp mill on March 24, 1997. The announcement prompted discussions between the company and the federal government as to the fate of the company's long-term contract and the resolution of pending claims against the United States government. On February 21, 1997, an agreement was reached between the two parties to cancel KPC's long-term timber contract and to release all legal claims between the company and the federal government. As part of the agreement, KPC would receive 300 MMBF of timber over a three-year period to be used for the continued operation of the company's sawmills. The U.S. also agreed to pay KPC $140 million to resolve all past and future legal claims against the federal government.

Absent the long-term contracts and the timber supply mandate of ANILCA, the Tongass timber program is, for the first time, comparable to that of other National Forests. While the Forest Service still plans to put forth a regular and stable timber program, the agency will do so without the force of statutory or contractual obligation. Among industry members, there is now a higher level of uncertainty with regard to future timber supplies. However, it is also true that without the processing requirements in the long-term contracts, the industry has greater latitude in determining the rate at which timber is purchased and processed. In any case, movement away from maintenance of an industry structure planned in the 1950's to an industry structure linked to the competitive market will be a lengthy and difficult process. Many of the obstacles the industry faced in the 1950's remain and others have emerged. Given Alaska's small population base, distance from markets, and relatively high operating costs, success in the wood products industry remains a challenge for even the most talented of entrepreneurs.

Within the last decade Japan--historically Alaska's largest trading partner--has more than doubled its imports of softwood lumber. Accounting for 14.9 million cubic meters in softwood logs and 10.9 million cubic meters of softwood lumber in 1996, Japan's demand for imported wood far exceeds the supply currently available from Alaska's forests. However, the primary issue for Alaska is not the size or growth of wood product markets, but achieving a competitive position in those markets.

Traditional lumber producers in Southeast Alaska face intense competition from regions with lower costs and/or higher productivity, such as the Pacific Northwest, Canada, New Zealand, Chile, and Europe (primarily Scandinavia). A host of engineered wood products are also capturing a share of the market traditionally filled by solid-wood building products. Alaska's wood product manufacturers will need to move swiftly and aggressively to counter these broader market trends if they are to remain viable over the long-run.

Market Demand over the Planning Cycle

The Tongass Forest Plan and Timber Supply

The Tongass Land Management Plan (TLMP) Revision was completed May 23, 1997. As stated in the Record of Decision for the Plan:

> *"A primary goal of the Forest Plan is to provide for the sustainability of the resources of the Tongass National Forest, while directing the coordination of multiple uses, such as outdoor recreation, timber, wildlife, fish, watershed and wilderness."* [8]

Thus, the Forest Plan established the framework needed to develop a timber program that was consistent with the multiple use provisions in Section 101 of the Tongass Timber Reform Act. The Forest Plan classifies lands suitable for timber production and determines where timber harvesting should be allowed, in accordance with the regulations of the National Forest Management Act (NFMA), 36 CFR 291.14(a), and Section 102 of the Tongass Timber Reform Act. Tentatively suitable lands have the biological capability, and availability, to produce commercial wood products. The tentatively suitable land base on the Tongass is currently 2.4 million acres.[9]

Land Use Designations (LUDs) in the Forest Plan further define where specific management activities may occur and ensure the biological integrity of the forest ecosystem. To provide for a full spectrum of forest ecosystem conditions and resource uses, some of the LUDs restrict timber harvest activity on lands otherwise suitable for commercial timber production. Finally, even within LUDs where timber harvest is permitted, there may be unanticipated factors that effectively reduce the suitable landbase on a case-by-case basis. Based on past experiences with this project-level "falldown", the Forest Service was able to estimate the cumulative effect on the suitable landbase in the Forest Plan. After complying with all legal mandates, providing for the sustainability of forest ecosystems and ecosystem processes, and allowing for unforeseen events in Plan implementation, roughly 676,000 acres are considered suitable and available for commercial timber production.

The allowable sale quantity (ASQ) is the maximum amount of timber that may be scheduled for sale from the suitable lands on the Forest over the next ten years (36 CFR 219.3). It is usually expressed as an annual average. The Tongass Land Management Plan provides for an ASQ of 2.67 BBF per decade, the equivalent of 267 MMBF per year. Although sale volumes may exceed 267 MMBF in any given year, the total program must remain within the ASQ for the decade.

The ASQ consists of two separate "Non-Interchangeable Components" (NICs) referred to as NIC I (2.2 BBF) and NIC II (.47 BBF). The term "non-interchangeable" refers to the fact that

[8] United States Department of Agriculture, Forest Service, R10-MB-338a, pg. 1.

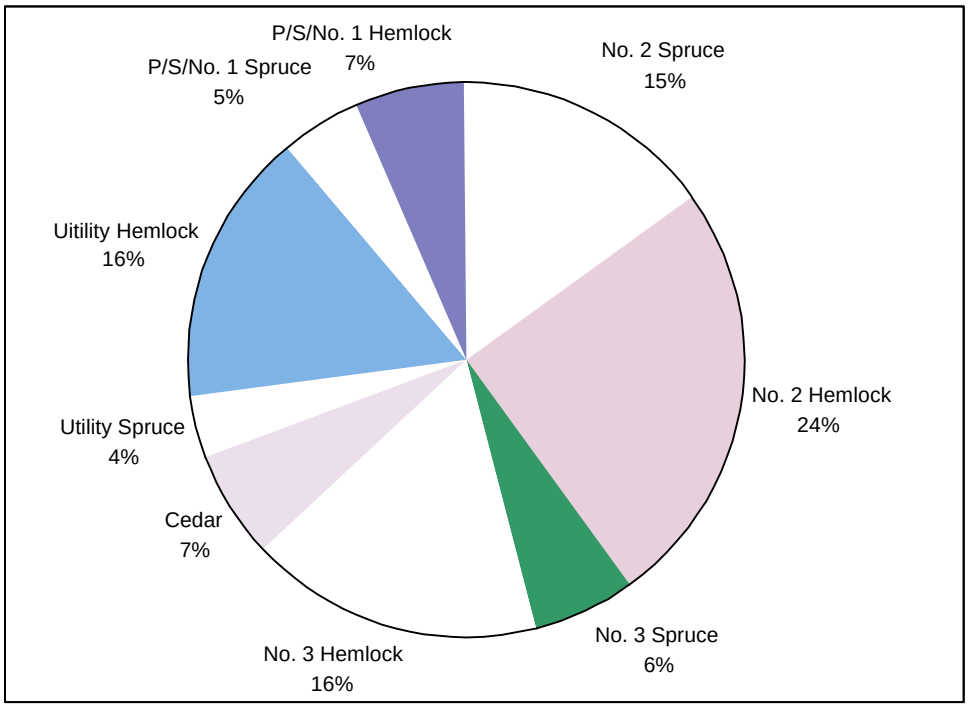
[9] United States Department of Agriculture, Forest Service, Tongass Land Management Plan Revision Final Environmental Impact Statement: Part 1, R10-MB-338b, January 1997, pg. 3-250.

lower sale levels in one component in the course of the decade may not be compensated for by higher sale levels in the other. As with the ASQ, the NIC limitations are binding on a decadal basis. The NIC I component includes timberlands that can be harvested with normal logging systems. The NIC II component includes timberlands with especially high logging costs due to isolation or special equipment requirements. Relative to historic sale patterns, a larger proportion of the ASQ (about 20 percent) will be supplied from areas of the Tongass with the highest logging costs.

The ASQ is an upper limit on sale volume. It is not a future sale projection or a target and does not reflect all of the factors that may influence future sale levels. With regard to the timber provisions of the Tongass Timber Reform Act, the ASQ represents the maximum timber supply the Forest Service can make available to meet market demand over the next decade. Just as timber demand is more accurately represented by a curve, timber supply is also more accurately represented as a set of price/volume relationships. Because the available timber supply is limited by the ASQ and by the Federal budget process, timber supply curves from the Tongass tend to be relatively inelastic with respect to price. Although higher stumpage prices may initially bring the timber from the NIC II component into the market, continued price increases cannot be expected to bring forth additional supplies.[10]

The species and grade distribution for the commercial timberlands of the Tongass is shown in Figure 1. The composition of a specific timber sale may vary considerably from this forestwide average, however, it is important to note that roughly 42 percent of the timber inventory is comprised of the lower grade #3 and utility logs. Until recently, the region's pulp industry provided an outlet for this material. Ultimately, the future of the industry rests on developing the ability to economically process or otherwise dispose of this component of the wood supply.

Figure 1. Species and Grade Distribution – Tongass National Forest Suitable Landbase



[10] However, all things being equal, under better market conditions, buyers will tend to purchase and process more of this finite supply.

Ten-Year Harvest Projections

Over the ten- to fifteen-year planning cycle, the number of firms in an industry may increase or decrease in response to trends in industry performance and profitability. Therefore, when projecting market demand over this time period, it must be assumed that all inputs to the manufacturing process--including the number and type of processing facilities in the region--are subject to change.[11] Other changes in the industry over a longer period of time may include technological improvements, productivity gains, increased utilization of raw materials, and the addition of new processing capacity and capability to older facilities.

As the Tongass Land Management Plan was being revised, research economists at the Pacific Northwest Research Station (PNW) were asked to update their earlier projections of Alaska timber products output and timber harvest by ownership. The most recent projections of timber harvest over the planning cycle account for several dramatic changes in the region's manufacturing capabilities, increased competition from a number of sources, and the steady erosion of North America's share of Japanese timber markets.

Table 1. Projected National Forest Timber Harvest – Alaska (million board feet, sawlog + utility volume)

Year	Low	Med	High
1998	77.3	86	112.2
1999	86.4	99.3	127.9
2000	95.5	115.9	142.7
2001	104.6	129.0	157.7
2002	113.7	134.9	173.1
2003	122.8	140.8	188.9
2004	131.9	146.5	205.0
2005	131.9	152.2	221.4
2006	131.9	157.8	238.2
2007	132.0	163.4	255.3
Average	112.8	132.6	182.2

Three scenarios--labeled "Low", "Medium", and "High"--were developed to display alternative futures for Alaska's forest sector and the resulting demand for National Forest timber (Table 1). The values of key parameters for each forecast scenario are compared in Table 2. In the "Low" scenario, Alaska's market share is limited by increasing stumpage costs and higher logging and manufacturing costs. Moreover, the North American share of the Japanese market is not expected to increase appreciably. In contrast, under the "High" scenario, Alaska is expected to develop a more efficient, competitive lumber industry, and to participate in a somewhat broader array of markets. Gains in efficiency are assumed to increase overrun ratios and reduce raw material input per unit of lumber output. The overall effect is a modest increase in timber harvest relative to the "Low" scenario.

[11] The "planning cycle" in TTRA is equated to the ten- to fifteen-year "planning period" referenced in the regulations implementing the National Forest Management Act (P.L. 94-588)

In their report, the researchers emphasized the uncertainty inherent in predicting the future demand for National Forest Timber:

> *We characterize the future for demand for National Forest timber as having a high degree of uncertainty because of the magnitude of recent changes in the Alaska forest sector, and because many of the factors that will determine the size and type of industry in the future cannot be predicted. The level and reliability of timber supplies from Alaska National Forests are only two among a number of sources of uncertainty; rates of economic growth in key markets, changing technology and tastes and preferences of consumers, and the strength of competition are among other sources of uncertainty.*[12]

As discussed later in this paper, the Alaska Region, in cooperation with the PNW Research Station, will continue to monitor trends in international timber markets and the way in which the Southeast Alaska timber industry responds to those trends. Significant changes in Alaska's manufacturing capacity, product mix, or competitive position, may warrant revision and reconsideration of the long-range harvest projections in the context of overall management goals.

[12] David J. Brooks and Richard W. Haynes, Timber products output and timber harvests in Alaska: projections for 1997-2010, Gen. Tech. Rep., PNW-GTR-409, Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 1997, pg. 2.

Table 2. Values for Key Elements of the "Low", "Medium", and "High" Timber Harvest Forecast Scenarios

	Fiscal Year	Alaska's Share of North American Shipments to Japan (Percent)			North America Share of Japanese Softwood Lumber Imports (Percent)			Share of Alaska Shipments to Export Markets (Proportion)			Overrun in Lumber Production (MBF l.t./MBF l.s.)		
Historic 1985-1996	1985	5.5			81.4			0.95			1.186		
	1986	6.5			86.6			0.95			1.175		
	1987	5.2			92.0			0.95			1.198		
	1988	5.6			93.5			0.95			1.220		
	1989	5.6			94.6			0.95			1.220		
	1990	6.8			85.7			0.95			1.220		
	1991	5.2			86.5			0.85			1.220		
	1992	4.1			86.9			0.60			1.220		
	1993	4.1			84.7			0.70			1.220		
	1994	3.2			79.8			0.60			1.220		
	1995	1.4			72.0			0.82			1.220		
	1996	0.7			70.4			0.71			1.220		
Projected 1997-2010		LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH	LOW	MED	HIGH
	1997	0.9	1.0	1.5	70.0	70.0	70.0	0.85	0.75	0.65	1.226	1.237	1.247
	1998	1.0	1.4	1.8	70.0	70.0	70.0	0.85	0.75	0.65	1.233	1.255	1.274
	1999	1.1	1.6	2.0	70.0	70.0	70.5	0.85	0.75	0.65	1.239	1.272	1.301
	2000	1.2	1.8	2.2	70.0	72.0	71.0	0.85	0.75	0.65	1.245	1.290	1.329
	2001	1.3	2.0	2.4	70.0	72.0	71.5	0.85	0.75	0.65	1.251	1.307	1.356
	2002	1.4	2.1	2.5	70.0	72.0	72.0	0.85	0.75	0.65	1.258	1.325	1.383
	2003	1.5	2.2	2.7	70.0	72.0	72.5	0.85	0.75	0.65	1.264	1.342	1.410
	2004	1.6	2.3	2.9	70.0	72.0	73.0	0.85	0.75	0.65	1.270	1.359	1.437
	2005	1.6	2.4	3.1	70.0	72.0	73.5	0.85	0.75	0.65	1.276	1.377	1.464
	2006	1.6	2.5	3.3	70.0	72.0	74.0	0.85	0.75	0.65	1.283	1.394	1.491
	2007	1.6	2.6	3.5	70.0	72.0	74.5	0.85	0.75	0.65	1.289	1.412	1.519
	2008	1.6	2.7	3.6	70.0	72.0	75.0	0.85	0.75	0.65	1.295	1.429	1.546
	2009	1.6	2.8	3.8	70.0	72.0	75.5	0.85	0.75	0.65	1.301	1.447	1.573
	2010	1.6	2.9	4.0	70.0	72.0	76.0	0.85	0.75	0.65	1.314	1.464	1.600

Source: Brooks and Haynes, 1997, pg. 10.

Annual Market Demand

Factors Influencing Timber Demand in the Short-Run

As specified in the Tongass Timber Reform Act, the Forest Service must also consider the annual market demand for timber from the Tongass. Determining the annual market demand is analogous to assessing industry performance in the short-run. In contrast, determining market demand over the planning cycle implies consideration of industry performance over the long run. Economic theory suggests that the output of individual firms and--by extension--the demand for inputs to production, depend upon the time frame examined.

In the short-run a firm will make use of its existing equipment to maximize profits or minimize losses. For example, a wood products manufacturer may alter the amount of wood processed or the number of shifts employed, but will generally not invest large sums or enter or exit a market on the basis of short-run performance. In the short-run a firm may even continue to operate at a loss, as long as the variable costs of production can be covered. Finally, in the short-run it is assumed that there will be no change in the number of individual firms in the industry. Under these conditions, resource demand tends to be fairly inelastic. In other words, the existing mills will absorb a relatively wide range of prices before making significant changes in the volume of timber purchased.

The factors influencing annual demand (i.e. the operating decisions made by individual firms in the short-run) may not be predictable or, in hindsight, economically rational. Annual timber demand may well be a function of realistic or unrealistic speculation, desire to preserve market share, or some intrinsic value realized by the owner/operator who is preserving a lifestyle preference. Other factors influencing the demand for Tongass timber on an annual basis include:

- the number, capacity, and efficiency of wood processors in the region
- the volume and value of standing inventory owned by the firm
- the cost and availability of alternate sources of supply
- the relative cost of capital, labor, and other inputs to production
- the demand for the products manufactured in Southeast Alaska
- the technology employed in manufacturing those products
- currency exchange rates among trading partners
- contractual agreements with the purchasers of end products, and
- the extent to which government policies enhance or restrict market opportunities.

The following approach to annual timber sale planning incorporates some of the methods used by business owners to manage their raw materials inventory. In short, by allowing the industry to accumulate and maintain an adequate timber inventory, harvest activity can proceed at a pace consistent with the demand for wood products. The Forest Service will monitor market conditions and industry activity and, within the limit of the ASQ, adjust annual timber offerings to keep pace with market behavior.

The use of adaptive management in timber sale planning requires a continuous cycle of monitoring, evaluation, and refinement. **Consequently, the program levels suggested here should be viewed as suggestive, rather than prescriptive, as new information will undoubtedly lead to revisions.** A long-term commitment to data collection and evaluation, as described in the monitoring plan (see page 24), is essential to the successful implementation of this approach.

The sections below describe the process and information used to develop a framework for planning annual timber offerings. A more detailed discussion of the assumptions used in this process is included in the following sections. First, the installed wood processing capacity, the historical rate of capacity utilization, the share of raw material supplied by the Tongass, and the characteristics of the average timber sale, are used to estimate the Tongass timber volume consumed each year at varying rates of industry operations. Second, the time lags involved in preparing, offering and acquiring timber from the National Forest are considered in determining the appropriate timber inventory to carry for a given level of industry operations. Finally, the difference between current and target inventories is determined and, together with the projected annual harvest, is used to estimate a range for the volume of timber likely to be purchased in the coming year.

Estimating the Annual Consumption of Tongass Timber

A Forest Service timber sale is essentially a bundle of different species and grades of timber, each of which will be valued and processed according to the expected product yield. The rate at which timber sales will be purchased and processed depends upon the raw material requirements of local manufacturers and the extent to which an average sale meets those requirements. Equation 1 shows how the relationship between manufacturing capability and raw material supply can be used to estimate theoretical timber consumption levels:

Equation 1. Tongass Timber Consumption, $e = (a \times b/c) \times d$

where

- a = **Installed and operable mill capacity**
- b = **Industry rate of capacity utilization**
- c = **Percent usable wood in average timber sale**
- d = **Share of industry raw material provided by the Tongass**

The following sections provide more detail on the data and assumptions used to determine the initial values for each of these parameters.

a. Installed and operable mill capacity. Processing capacity can be measured and reported in various ways, including:

1. *Design capacity.* This is the maximum output that can possibly be attained.
2. *Effective capacity.* This is the maximum output attainable given the desired product mix, scheduling considerations, machine maintenance, quality control, etc.

3. *Actual output.* This is the rate of output actually achieved. It cannot exceed effective capacity and is often less than effective capacity because of machinery breakdowns, employee absenteeism, defective output, shortage of materials, and other problems outside the control of the operations manager. [12]

By referring to various industry and government publications, one can get a general sense of mill capacity in Southeast Alaska, however, it is not always clear what the available data represent. Some mills report end product output vs. log throughput; others report design capacity vs. effective capacity. Consequently, there is a need for the systematic collection of information on the effective capacity of the wood product manufacturers in the region.

Industry experts can provide estimates of the effective capacity of a sawmill or other wood products facility on the basis of the installed equipment. The industry standard is to estimate log volume consumption during 250, 8-hour shifts per year. Double shifts do not necessarily double the effective mill capacity as the evening shift generally re-saws material rejected by the day shift.[13] Given this precise standardization of capacity, most operators, in consultation with a sawmill expert, can come up with a reasonable figure for effective mill capacity.[14] *For purposes of this analysis, the best available information (documented in Table 3) was used to arrive at a current installed processing of 281 million board feet annually (log scale).*

Because the emphasis here is on the short-run operating decisions of existing firms, capacity estimates for inoperative or incomplete facilities are not included. When there is evidence that new wood processing facilities (or expansions to existing mills) are moving past the planning stage to become viable wood processing entities (i.e. demonstrated financial commitment, lease or purchase of mill site, environmental permits approved, etc.) capacity figures will be increased accordingly. Conversely, permanent mill closures will trigger a downward adjustment in the reported industry capacity.

b. Industry rate of capacity utilization. In theory, with complete knowledge of the production functions, markets, and profit objectives for the sawmills listed in Table 3, the optimal rate of capacity utilization could be determined. In practice, the type of proprietary data needed is not likely to be made available. However, the historical operating rates for these mills and other similar operations can be used to estimate the typical level of operation for the industry.

Over the last fifteen years, the installed sawmilling capacity in Southeast Alaska has reportedly ranged from a high of 401 MMBF in 1983 to a low of 164 MMBF in 1996 (Table 4). Most of the reported capacity is associated with the sawmills owned and operated by the Ketchikan Pulp Company and the Alaska Pulp Corporation. In addition, a large sawmill at Klawock, a smaller mill in Haines, and timber operations owned by Steve Seley have been closed and reopened a number of times throughout the years. Finally, periodic surveys have thoroughly documented all milling operations in the region and indicate the continued presence of many small, owner-operated milling operations serving local markets for sawn products.

[12] William J. Stevenson, Production/Operations Management, Irwin, Illinois, 1986, 827 p.
[13] Ken Kilborn, Wood Products Technologist, Sawmill Assistance Service, Inc., personal communication.
[14] Some of this information has already been obtained through the State's Manufacturing Assistance Partnership Program. It is anticipated that a more complete report could be developed in one month's time at a cost of $8,000-$12,000.

Table 3. Summary of Available Data on Sawmill Capacity in Southeast Alaska

NAME OF MILL	ANNUAL CAPACITY (MMBF, l.s.)	INFORMATION SOURCE
KPC Annette Sawmill	69	70 MMBF l.t. capacity, 2 shifts, 5 days, 50 weeks/yr., overrun = 1.01 in 1996, Source: Louisiana-Pacific Annual Report, 1994.
KPC Ketchikan Sawmill	64	60 MMBF l.t. capacity, 2 shifts, 5 days, 50 weeks/yr., underrun = .94 in 1996, Source: Louisiana-Pacific Annual Report, 1994.
Wrangell Sawmill	40	Personal communication (Fred Walk, Director, Forest Management, USFS, Region 10, retired) with Silver Bay Logging Company 12/5/97.
Viking Lumber Company	35	Personal communication (Fred Walk, Director, Forest Management, USFS, Region 10, retired) with Kirk Dahlstrom, Viking Lumber Company 12/5/97. Based on two-shift operation with new equipment to be installed Spring '98.
Seley Corporation	24	24 MMBF/year log usage as reported in "Lewis Reef permit approved for Seley project", Ketchikan Daily News, July 16, 1997.
Pacific Rim Cedar	9	Personal communication (Fred Walk, Director, Forest Management, USFS, Region 10, retired) with Frank Age, Pacific Rim Cedar, 12/17/97.
Herring Bay Lumber	5	Personal communication (Fred Walk, Director, Forest Management, USFS, Region 10, retired) with Ben Fleenor, Herring Bay Lumber, 12/17/97.
Icy Straits Lumber	5	Letter from Icy Straits Lumber to Governor Knowles, 12/2/97.
Metlakatla Forest Products	5	Assuming 21.5 days/month, 25 MBF l.t./day, 20% overrun, as reported in Metlakatla Forest Products Business Plan.
Jim Ensely	7	Personal communication (Fred Walk, Director, Forest Management, USFS, Region 10, retired) with Al Rockwood, 12/17/97.
The Mill, Inc.	5	Estimated.
W.R.Tonsgard Lumber	5	Estimated.
Star Cedar Products	2	As reported in Governor's Timber Task Force Report, 1997
Black Bear Cedar	1	As reported in Governor's Timber Task Force Report, 1997
Misc. Small Sawmills	5	As reported in Governor's Timber Task Force Report, 1997
Total	281	

Estimates of lumber output in Southeast Alaska were compiled by the PNW Research Station and are included in Table 4 to determine the historical rate of capacity utilization in Alaska's lumber industry. As shown here, the rate of capacity utilization varies considerably and is closely linked to market conditions. For example, the data indicates that from 1983-1985, roughly 33- 36 percent of the installed capacity was utilized. This is in sharp contrast to the capacity utilization rate of 76-88 percent observed during the peak of the market cycle (1991-1993).

Data from the Pacific Northwest, Alaska's competitor region, suggests an average capacity utilization rate of 71 percent from 1985-1995 (Table 5). In contrast, Alaska mills averaged 51 percent utilization for the same time period. There are a number of possible explanations for the relatively low rate of capacity utilization in Alaska's sawmills. As noted previously, most of the sawmills in Southeast Alaska have been in place for many years (most of the installed capacity dates back to the early 1970's). Because the initial investment has been amortized, decision about production levels for these mills may be disproportionately influenced by short-term profitability. It seems likely that, given the minimal investment costs, Alaska's mills will be more likely to close during periods of poor markets. Coupled with Alaska's relatively high operating costs, this heightened sensitivity to market cycles serves to amplify the effect on lumber output in the region. Poor markets trigger temporary mill closures only to be followed by a resurgence in production after the market rebounds.

For purposes of this analysis, three alternative scenarios are considered. Each incorporates a different level of capacity utilization. At 34 percent, the "Low" scenario assumes a capacity utilization rate equivalent to the three-year average observed during the bottom of the market cycle (1983-1985). In contrast, the 80 percent capacity utilization rate of the "High" scenario is based on the three-year average observed during the peak of the market cycle (1991-1993). The "Medium" scenario is based on the average estimated utilization rate in Southeast Alaska from 1981-1997 (51 percent).

Table 4. Sawmills, Lumber Output, and Capacity Utilization—Estimates for Southeast Alaska

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Alaska Timber Company aka. Klawock Timber Alaska, Viking Lumber Company	60	60	60	60	closed	-------	-------	60	48	70	closed	-------	-------	70	30	30	35	35
Alaska Pulp Corporation Wrangell Sawmill aka Alaska Wood Products, Wrangell Forest Products	68	68	100	100	100	108	108	108	108	110	110	110	110	110	closed	-------	-------	40
Chilkoot Lumber Company aka. Schnabel Lumber Co., Pacific Forest Products, Inc.	30	30	30	45	closed	-------	-------	50	50	50	closed	-------	-------	------	-------	-------	-------	--------
Ketchikan Pulp Company Annette Island Mill	60	60	100	100	100	90	90	90	70	70	70	70	70	70	60	60	69	69
Ketchikan Pulp Company Ward Cove Mill aka. Ketchikan Spruce Mills	60	60	60	closed	-------	-------	-------	------	50	40	40	40	40	40	50	50	64	64
Mitkof Lumber Company	15	15	15	20	20	20	closed	------	------	-------	-------	-------	-------	------	-------	-------	-------	--------
Seley Corporation	------	------	------	-------	-------	------	-------	------	------	10	30	30	30	30	35	closed	-------	24
Yakutat-Kwan/Koncor	-------	-------	-------	25	25	closed	-------	------	------	-------	-------	-------	-------	------	-------	-------	-------	--------
Miscellaneous Small Sawmills	36	36	36	36	36	12	36	36	36	20	10	10	35	34	24	24	52	49
Total	329	329	401	386	281	230	234	344	362	370	260	260	285	354	199	164	220	281
Lumber Output (MMBF)	206	181	144	127	92	126	140	176	193	223	200	228	217	186	62	38	45	n/a
Capacity Utilization	63%	55%	36%	33%	33%	55%	60%	51%	53%	60%	77%	88%	76%	53%	31%	23%	20%	n/a

Source Documents: Manufacturing Plants on or near National Forest Areas, Region 10 USDA Forest Service, 1959
The Primary Wood Industry in Alaska, A Directory of Loggers, Sawmills and Pulp mills in the State of Alaska, USDA Forest Service, 1967
Alaska Forest Products Industry, A directory of Loggers, Lumber Dealers, Sawmills, and other Forest Industries in the State of Alaska, USDA Forest Service, 1972
Alaska's Forest Products Industry Sawmill Directory, USDA Forest Service, Alaska Region, 1978
Timber Supply and Demand Report, USDA Forest Service Region 10, 1984, 1985, 1986, 1992, 1994, 1996, lumber output for 1997 is estimated
Directory of Alaska Forest Products Manufacturers, Alaska Department of Commerce and Economic Development, 1988
Alaska Forest Products Manufacturer's Directory, Alaska Department of Commerce and Economic Development, 1990

Table 5. Capacity and Utilization Estimates for Selected Western States

	Installed 8-hour capacity	Avg. operating days	Avg. shifts per day	Two-shift capacity MMBF, l.t. (1)	Nominal operating capacity (2)	Production MMBF, l.t.	Utilization rate (3)
Oregon							
1985	23,821	221	1.51	11,911	7,949	7,211	.605
1986						8,149	
1987						8,846	
1988	24,847	229	1.57	12,424	8,933	8,601	.692
1989						8,512	
1990	24,229			12,115		7,511	.620
1991						6,595	
1992	13,737	231	1.61	6,869	5,109	6,200	.903
1993						5,448	
1994	13,670	244	1.58	6,835	5,270	5,703	.834
1995						4,953	
Washington							
1985						3,419	
1986	11,178	201	1.6	5,589	3,595	4,132	.739
1987						4,645	
1988	12,528	202	1.6	6,624	4,049	4,408	.704
1989						4,274	
1990	12,573	206	1.6	6,287	4,144	3,919	.623
1991						3,820	
1992	12,075	209	1.6	6,038	4,038	4,072	.674
1993						3,863	
1994			1.6			4,200	
1995						4,095	
California							
1985	13,601	223	1,54	6,801	4,671	4,168	.613
1986						4,865	
1987						5,408	
1988	15,716	233	1.59	7,858	5,822	5,671	.722
1989						5,320	
1990	15,326			7,663		4,981	.650
1991						4,218	
1992	9,997	230	1.59	4,999	3,656	3,997	.800
1993						3,539	
1994	9,331	236	1.6	4,666	3,523	3,521	.755
1995						3,169	

1) Operating days assumed: 250
2) Based on average operating days and shifts per day
3) Based on two-shift capacity

Sources: Installed 8-hour capacities, operating day and shifts per day are from published mill surveys. Production data are from WWPA (reported in Warren, 1997). Capacity data for Oregon and California are estimated.

c. Percent usable wood in average timber sale. The extent to which the raw material in a sale can be fully utilized depends upon the technology installed in the region, the degree of processing infrastructure and integration, log export policies, and market conditions. Both Western Red Cedar and Alaska Yellow Cedar have traditionally been considered surplus to local manufacturing needs, although industry members have recently shown more interest in manufacturing Western Red Cedar. One of the new mills in the region, owned by Seley Corporation, has been designed specifically to accommodate the manufacture of products from this material. In fiscal year 1997, the Forest Service began implementing procedures to phase out the export of Western Red Cedar from the Tongass. For purposes of this analysis, it is assumed that Western Red Cedar logs will be processed locally and Alaska Yellow Cedar logs will continue to be exported in round-log form.

Special consideration must also be given to "utility-grade" logs. This material (estimated at 18 percent of average timber sale volume) is not currently used in lumber manufacture. It is assumed that utility-grade logs will be chipped in the region before shipping to other destinations.

Finally, depending on market conditions and log grade, varying percentages of the sawlog component of the harvest volume have been processed in the region's sawmills. The percentage sawn in Alaska can be expected to increase over time as the industry acquires the equipment needed to utilize smaller diameter logs and as fewer log export permits are granted. *This analysis adopts the percentages used by the PNW Research Station in the"High", "Medium", and "Low" timber harvest scenarios.* Sawlogs that are not processed locally are typically small diameter, grades three and four. Historically, this material has been chipped for pulp manufacture.

Table 6. Timber Utilization in Southeast Alaska Sawmills

Species/Grade	**Use by SE Alaska Industry**	**Percentage of Timber Sale Volume**		
		----------Market Scenario--------		
		High	**Medium**	**Low**
Alaska Yellow Cedar	Exported in round-log form	2%[15]	2%	2%
Hemlock/Spruce/Red Cedar Utility	Chipped or exported, not processed in region's sawmills	18%[16]	18%	18%
Hemlock/Spruce/Red Cedar Sawlogs (low-grade)	Chipped or exported, not sawn in region's sawmills	0%[17]	13%	32%
Hemlock/Spruce/Red Cedar Sawlogs (higher grade)	Sawn in region's mills	80%	67%	48%
Total		100%	100%	100%

d. Share of industry raw material provided by the Tongass. Although the Tongass National Forest has historically provided the bulk of the timber processed in Southeast Alaska, other

[15] United States Department of Agriculture, Forest Service, Tongass Land Management Plan Final Environmental Impact Statement, January 1997, pg. 3-285, Table 3-85.
[16] David J. Brooks and Richard W. Haynes, Timber products output and timber harvests in Alaska: projections for 1997-2010, Gen. Tech. Rep., PNW-GTR-409, Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station, 1997, pg. 14, Table 6.
[17] See Brooks, 1997. Calculated from Table 6 (low grade and utility net of utility component).

entities have occasionally participated in this market as well. The Alaska Native Corporations have supplied Alaska's pulp mills with pulp logs and the State of Alaska maintains a small timber program in the region. Most sawlogs from these non-federal sources have been exported from the state without processing. However, recent changes in overseas timber markets are forcing a new look at potential domestic uses for some of this timber supply. For instance, the Ketchikan Pulp Company and Sealaska (the Regional Native Corporation) have been studying the feasibility of manufacturing veneer in Southeast Alaska.

At the present time, there appears to be no compelling reason to expect private timber supplies to offset industry dependence on less expensive federal timber. The steady erosion of the hemlock log market in Asia suggests that private timber owners will be exploring every opportunity to diversify their products and markets. However, it is still not clear whether efforts to find markets for hemlock logs will lead to wood products manufacturing in Southeast Alaska as a viable outlet for private timber supplies.

In contrast, the State of Alaska has directed considerable effort toward negotiated sales and other provisions designed to encourage local processing of State timber resources. *Over the next five years, the State Division of Forestry plans to offer an average annual timber sale volume of 22.5 MMBF in Southeast Alaska. Although the smaller sales will likely still be exported in the round, for purposes of this analysis, it is assumed that most of this timber will receive some local processing.*

Determining Timber Inventory Objectives

In addition to the timber processed in a given year, the annual demand for timber includes the volume needed to build, rebuild, or maintain an adequate "buffer stock" of uncut timber. **This backlog of uncut timber is, in essence, the industry's "dependable timber supply."** A sufficient supply of volume under contract allows the industry to adjust output in response to market conditions. It also appears to play a significant role in the stabilization of regional timber prices.[18] Finally, basic operational considerations underscore the importance of maintaining sufficient timber inventories. For example, after a sale is awarded, it can take an operator one or more years to complete the road construction necessary to gain access to the timber. While this work is underway, the purchaser is harvesting and processing timber purchased in prior years. Consequently, timber processors generally maintain some volume under contract that is carried over from one year to the next.

What is an adequate level of uncut timber inventory? During the late 1960s and early 1970s, the ratio of uncut volume inventory to sales (roughly equivalent to harvest at that time) ran at approximately 2:1 for the Forest Service Region 6 (PNW), 3:1 in Region 5 (PSW), and 2.75:1 in the northern Rockies (Region 1). During the 1980-82 recession, the uncut/sold volume ratio increased to roughly 4.5:1. By 1987, the bulk of the timber surplus had been reconveyed to the Forest Service under special contract relief legislation and the uncut/sold volume ratio returned to the level observed in the 1970's.[19] Data for the Tongass independent sale program shows substantial fluctuation in this ratio. This may reflect the dominance of the two long-term timber contracts during this time period and/or periodic shortfalls in timber sale offerings (Table 7).

[18] Darius M. Adams, et al.. "Is the Level of National Forest Timber Harvest Sensitive to Price?", Land Economics, 1991, 67(1): 74-84.

[19] Darius M. Adams and Richard W. Haynes, "A Model of National Forest Timber Supply and Stumpage Markets in the Western United States", Forest Science, 1989, 35(2): 401-424.

Table 7. Tongass Independent Sale Program Statistics (volume in million board feet)

Fiscal Year	Volume Under Contract (VUC)	Harvest (H)	Ratio H/VUC	Fiscal Year	Volume Under Contract (VUC)	Harvest (H)	Ratio H/VUC
1981	157	142	1.11	1989	309	142	2.18
1982	173	150	1.15	1990	259	173	1.50
1983	103	55	1.87	1991	112	90	1.24
1984	129	71	1.82	1992	74	72	1.03
1985	108	36	3.00	1993	83	55	1.51
1986	114	60	1.90	1994	73	48	1.52
1987	243	72	3.38	1995	64	59	1.08
1988	339	100	3.39	1996	46	27	1.70

Planning for and managing an adequate raw materials inventory is an important business function. Precise formulas have been developed to help firms determine the appropriate level of inventory to carry given inventory carrying costs, the anticipated demand for finished products, the speed at which additional raw materials can be obtained (the lead time), and the variability in lead times. The firm will generally wish to carry a raw material inventory equal to the expected demand during lead time plus an extra buffer (or safety stock) to cover excess product demand or variation in lead time.

Some of the basic principles of inventory management can be used to calculate the optimal level of uncut volume under contract to be carried by the industry. The level of inventory *(I)* to carry to assure a 99 percent probability of meeting a given level of timber consumption *(e)* is estimated as follows:

Equation 2.

$$I = e\overline{LT} + ze(S_{LT})$$

where

e = **Annual Tongass timber consumption**
$\overline{LT}$ = **Average lead time**
S_{LT} = **Standard deviation of lead time** [20]
z = **Area under the standardized normal curve at 99% probability (i.e. 2.326)**

As shown here, the level of inventory to carry is a function of the time it takes to replenish raw material supplies--the "lead time." For purposes of this analysis, the lead time is the amount of time that passes between the sale award date and the delivery of the logs to the mill. Sale records from 22 Tongass timber sales were analyzed to determine the average elapsed time between the sale award date to the first recorded timber removals. The sales reviewed averaged a twelve-month lead time with a standard deviation of nine months (Table 8).

[20] William J. Stevenson, Production/Operations Management. Irwin, Illinois, 1986, pp 499-500.

Table 8. Lead Time for Selected Tongass Timber Sales

Sale Name	Volume (MMBF)	Advertised Rate ($/MBF)	High Bid ($/MBF)	Miles of Road	Quarter/Year Awarded	Quarter/Year First Harvest Recorded	Elapsed Time (Lead Time, quarters)	Purchaser
Basin	9.1	$ 4.60	$ 28.10	4	4/86	4/89	12	Spring Valley, Inc.
Outback	14.4	$118.45	$118.45	5	1/90	4/90	3	Seley, Inc.
Missionary	4.9	$122.41	$169.09	0	4/91	1/92	8	Seley, Inc.
Target	2.0	$150.86	$183.82	0	1/90	3/91	6	Mitkof Lumber, Inc.
Froot	3.1	$153.52	$170.01	0	1/91	4/92	7	Mitkof Lumber, Inc.
Old Hermit	14.5	$ 28.76	$ 63.52	4	1/91	1/92	0	Alaska Pulp Co.
Starfish					1/93	3/93	2	
White Alice Salvage	2.1	$ 4.57	$113.00	0	1/93	2/93	1	Jim Ensley
Rynda Boomstick	4.5	$ 4.50	$ 7.62	0	1/94	2/95	5	The Mill, Inc.
Twin	3.7	$ 25.36	$ 31.50	2	2/93	4/93	2	Jim Ensley
Deep Bay South	9.7	$ 8.63	$ 9.00	4	1/93	4/94	7	Fox River
Sumner Salvage	3.0	$ 3.25	$ 3.25	0	2/93	4/95	6	The Mill, Inc.
Midpoint	5.3	$232.53	$232.53	4	2/94	1/95	3	Metlakatla Forest Products
Bohemia	35.5	$255.20	$315.24	27	2/96	4/96	2	Viking Lumber Co.
Snowcat	5.0	$ 42.42	$ 50.14	0	3/91	1/92	2	Ketchikan Pulp Co.
Snow Pup	5.3	$ 3.26	$ 3.44	4	3/92	1/94	6	Cedarville
Frosty	30.1	$ 15.29	$ 69.46	12	4/92	1/93	1	Cedarville
Portage Bay Salvage	6.0	$ 76.52	$105.74	0	4/92	1/93	1	Seley, Inc.
Campbell					4/94	4/95	4	
Combination	10.3	$ 41.92	$ 53.70	3	4/89	3/091	4	Seley, Inc.
Average Lead Time:	4 quarters							
Variance:	9 quarters							
Standard Deviation:	3 quarters							

Estimating Likely Timber Purchases

Given estimates of annual timber consumption, the inventory objectives of the industry and the harvest projections completed by the PNW Research Station, it is possible to estimate the volume of timber likely to be purchased each year. As shown in Table 9, a range of likely purchase volumes is estimated for each of three market scenarios. The key characteristics of each scenario are listed below:

Characteristics of the "High" Market Scenario:

- *Higher levels of lumber production, log exports and timber harvests in Alaska*
- *Development of a more efficient, more competitive industry in Alaska*
- *Markets willing to pay a premium for lumber manufactured from old-growth logs*
- *North American lumber regains a greater share of the Japanese market*
- *Mills in Alaska increase their share of North American shipments*
- *Alaska shipments to U.S. domestic markets increase*
- *Sawmills in Alaska are able to profitably use nearly the entire range of sawlog grades that comprise the timber inventory*

Characteristics of the "Low" Market Scenario:

- *The niche in which Alaska is expected to be able to compete is small, in both domestic and export markets*
- *Higher costs and competition limit Alaska's opportunities*
- *Only small gains in efficiency are assumed*
- *Sawmills in Alaska are assumed to be able to use only the higher grade sawlogs; half the inventory is excess to the raw material requirements of Alaska mills*
- *North American producers as a group do not regain the share of the Japanese market they had in the 1980's*

Characteristics of the "Medium" Market Scenario:

- *Alaska regains some of the export market lost in the past few years and U.S. domestic markets continue to be important*
- *North American shipments of softwood lumber to Japan increase in quantity and in their share of Japanese imports for 1997 through 2010*
- *Alaska's share of North American exports to Japan increases*
- *Alaska takes advantage of the market niches in which it has a comparative advantage: products manufactured from old-growth spruce and, to some extent, old-growth hemlock*
- *Lumber recovery increases*
- *Alaska's ability to manufacture and market forest products improves*
- *The cost disadvantages that Alaska currently faces in harvesting timber and manufacturing lumber do not increase and may in fact decrease*
- *Manufacturing in Alaska is dependent on sawlogs used to manufacture lumber that is competitive in both export and U.S. domestic markets and all residues from lumber manufacturing can be marketed*

As discussed below, the market scenarios provide the rationale for choosing among different production scenarios and processing efficiencies and help to ensure that the framework used for timber sale planning is internally consistent and consistent with economic theory.

The first step in determining the range of timber purchases expected each year is to adjust mill capacity estimates (Table 9, line 1) by the utilization rate assumed for each market scenario (Table 9, line 2). The result is an estimate of the volume of timber that will be processed at three different market levels. These figures are then adjusted upward to account for the components of the Tongass timber supply that are harvested but not processed locally (Table 9, line 3). A final adjustment is made to account for timber obtained from sources other than the Tongass (Table 9, line 4). Given this set of assumptions, the volume of Tongass timber consumed should theoretically fall within the range of 179-253 MMBF, depending on market conditions and efficiency of operations (Table 9, line 5).

The second step in determining the timber purchase range is to estimate the volume of uncut timber inventory that is appropriate to carry under different market conditions. As described on pages 21-23, the appropriate level of inventory to carry depends upon the volume expected to be processed each year (Table 9, line 5) and the amount of time needed to replenish inventory (lead time). The relationship is summarized in Equation 2 (page 22) and in line 9 of the "Notation" column in Table 9. Because estimates of the volume of timber processed vary by scenario, the timber inventory requirement also varies. Given the assumptions listed for each scenario, the appropriate level of uncut timber inventory is estimated to range from 491 MMBF to 694 MMBF (Table 9, line 9).

Finally, the likely purchase range incorporates the harvest projections developed by the PNW Research Station (Table 9, line 12). For each of the three market scenarios the lower end of the expected timber purchase range is simply the projected harvest level. This assumes that, at a minimum, processors will want to replace the volume removed from inventory. The upper end of each range is the sum of: 1) the volume, if any, needed to bring the existing inventory of uncut timber up to the level desired, and 2) the volume needed to replace the projected harvest.

Example Application:
"Determining the Range of Expected Timber Purchases for FY 1999"

Although they are preliminary figures, the timber program statistics available at the FY 1998 mid-year illustrate how this framework could be used to set the annual sale program for FY 1999. As shown in Table 9, under the "Low" market scenario, the uncut timber inventory (as of 6/30/98) was 50 MMBF lower than the level desired (Table 9, line 9 – line 10). Therefore, estimates of the volume of timber likely to be purchased in FY 1999 include the sale volume needed to build the inventory, plus the sale volume needed to replace the projected harvest. Accordingly, under this scenario, FY 1999 timber sale purchases are estimated to range from 86 MMBF (the projected harvest) to 136 MMBF (50 MMBF to build the inventory and 86 MMBF to replace the projected harvest). Similarly, the "Medium" scenario suggests a purchase volume range of 89 MMBF to 188 MMBF (99 MMBF, inventory + 89 MMBF, harvest).

Table 9. Determining the Range of Expected Timber Purchases		Market Scenarios		
Element	Notation	Low	Medium	High
1. Installed and operable mill capacity (MMBF, log scale)	a	281	281	281
2. Industry rate of capacity utilization	b	34%	51%	80%
3. Percent usable wood in average timber sale	c	48%	67%	80%
4. Share of industry raw material provided by the Tongass	d	90%	90%	90%
5. Annual Tongass timber consumption (MMBF, theoretical)	$(e) = (a \times b/c) \times d$	179	193	253
6. Standard deviation of lead time (years)	σ_{LT}	.75	.75	.75
7. Desired probability of meeting consumption level (line 5)		99%	99%	99%
8. Value of t-statistic		2.326	2.326	2.326
9. Timber inventory requirements (MMBF)	$i_r = e\overline{LT} + z e(\sigma_{LT})$	491	530	694
10. Current timber inventory (MMBF, 6/30/98)	i_c	441	441	441
11. Projected harvest (MMBF), Fiscal Year 1999	h	86	99	128
12. Inventory shortfall (MMBF)	$i_r - i_c$	50	89	253
13. Range of expected timber purchases (MMBF), FY 1999	$\lfloor h \rfloor .. \lfloor i_r - i_c + h \rfloor$	86-136	99-188	128-256[21]

PRELIMINARY NUMBERS FOR EXAMPLE ONLY

[21] The upper limit on the high scenario is set at twice the expected harvest level. Historically, during periods of high markets, the industry has harvested more than it has purchased. Peak markets for end products translate into higher stumpage values which would put downward pressure on stumpage volume purchases.

Using the same methodology, the "High" scenario suggests a relatively large purchase volume range of 128 MMBF to 381 MMBF (253 MMBF, inventory + 128 MMBF, harvest). However, it seems highly unlikely that timber buyers will purchase three times the volume of timber harvested in any given year. In fact, a review of purchase activity over the last 15 years shows that this has never occurred. The maximum ratio between purchase and harvest observed during this time period was 2.33:1(for the independent sale program). In fact during periods of high markets, the industry has tended to harvest more than it has purchased. This is a logical outcome of the higher stumpage prices that are associated with strong timber markets. In light of these observations, for this timber sale planning exercise, the maximum ratio between purchase and harvest is set at 2:1. This effectively limits the upper end of the likely purchase volume under "High" scenario to 256 MMBF.

Example Application: "Setting the Timber Offer Level for FY 1999"

As shown in Table 9, different assumptions about markets and industry configuration yield different outcomes and not all values within the full range displayed here are equally likely. In particular, current information suggests relatively poor timber market conditions, low capacity utilization rates in Alaska's mills and increasing harvest costs associated with the Revised Tongass Land Management Plan. Relative to the recent past, timber inventory is substantial, industry capacity utilization rates are low, Alaska's share of Japanese markets has declined, and there is no evidence of industry-wide changes in processing efficiency. Thus, even a cursory evaluation indicates that the current state of Southeast Alaska timber markets is characteristic of the "Low" market scenario. Under these conditions, the preliminary data available in mid-1998 suggest that the volume of Tongass timber purchased in FY 1999 will be in the range of 86 to 136 MMBF.

In choosing among an array of possible offer levels, it is important to anticipate the consequences of a "wrong" decision. Again, the manager must have access to specific and current information in order to judge the outcome of future actions. In terms of short-term economic consequences, over-supplying the market is less damaging than under-supplying it. If more timber is offered than purchased in a given year, the unsold volume is still available for re-offer in future years at a minimal investment. Any environmental effects from harvesting the timber are postponed. However, a shortfall in the supply of timber available for harvest in a given year can be financially devastating to the industry.

Currently the industry as a whole has an adequate supply of timber under contract to satisfy the projected harvest level in FY 1999 for all scenarios. Decisions about the FY 1999 offer level, therefore, are not likely to constrain FY 1999 industry operations but may have a significant effect on the industry's ability to meet market demand for products in future years. Given these considerations, it would be reasonable to set the initial FY 1999 offer at the upper end of the expected purchase range for the "Low" market scenario (in this example, 136 MMBF). Under this approach, the offer level would allow the industry to keep pace with harvest activity up to and including the level projected under the "High" scenario. If the actual harvest level is equal to the projected harvest for the "Low" scenario, the industry will have the opportunity to meet inventory objectives. If harvest levels are lower than projected, the industry may begin to accumulate "excess" inventory. Any such "inventory surplus" will be accounted for in the process of setting the offer level for future years.

In addition to economic factors, planning the annual timber program requires a realistic assessment of the likelihood of delays from permitting processes, environmental analyses, administrative appeals, and/or litigation. Sufficient contingency volume must be included in the twelve-month schedule to ensure that, to the extent possible, the target delivered sale volume is achieved. Finally, budget and organizational constraints limit the extent to which the Forest Service can respond to economic cycles and the associated fluctuations in timber demand. All of these factors must be considered in evaluating the annual market demand for timber and setting annual timber offerings.

In the final analysis, planning the annual timber sale program is an exercise in professional judgement. The purpose of this paper is to clearly identify the extent to which economic analysis contributes to this decision-making process. The procedures described here will allow the decision-maker to make an informed judgement about the volume of timber to offer when timber market conditions are relatively high and falling, relatively low and improving, or somewhere in between.

Example Implementation Schedule

Using fiscal year 1999 as an example, the procedures for including market demand in timber sale planning will be implemented as follows:

June 1998: Estimate the likely purchase volume range for fiscal year 1999 using most current data available. Develop six-month firm and twelve-month tentative timber sale schedules for fiscal year 1999 based on budget and workforce considerations and after reviewing the timber market indicators listed above.

December 1998: Review FY 1999 timber sale schedule and revise as necessary after reviewing the timber market indicators listed above.

June 1999: Estimate the likely purchase volume range for fiscal year 2000 using most current data available. Develop six-month firm and twelve-month tentative timber sale schedules for fiscal year 2000 based on budget and workforce considerations and after reviewing the timber market indicators listed above.

Revising Timber Sale Schedules

The following timber market indicators will be monitored and reviewed semi-annually to ensure that the most current market conditions and trends are considered in the development of timber sale schedules.

1. **End Product Selling Values.** Timber harvest activity and mill utilization rates are directly related to market cycles. A comparison of current end product selling values with the average observed over a ten-year period will help the Forest Service determine whether current market conditions are more indicative of a “High”, “Medium”, or “Low” market scenario.

2. **Number and characteristics of unsold sale offerings.** Actual purchase activity provides immediate feedback about market conditions. Consistent no-bid sales may be an indicator of excess supply. Poor markets, a disproportionately high level of volume under contract, or an excessive amount of economically marginal timber in the sale package may result in an increase in “no-bid” timber sales. Conversely, when timber is scarce relative to demand, buyers will tend to be more accepting of sale characteristics they might otherwise avoid.

3. **Rate of change in volume under contract.** Consistent with national policy, the Region’s objective is for the industry as a whole to have two to three years of unharvested volume under contract at any point in time. This is also consistent with industry objectives of maintaining an inventory of uncut volume to carry operations through the “lead time” in acquiring new timber sales. When the volume under contract is rising, this is an indication that sale offerings may be running ahead of demand. Conversely, when volume under contract is falling, this is an indication that sale offerings may be lagging behind demand.

4. **Number of bidders for individual sales.** When markets are favorable and several independent mills are in operation, bidder participation will be high. Competition, as measured by the number of bidders per sale, will also be greater when timber supplies are tight relative to production goals and when new buyers are entering the market.

5. **Bid ratio.** The ratio of the high bid to the appraised value of a timber sale is referred to as the "bid ratio." Bid ratios are another indicator of conditions in local timber markets. When market conditions are favorable and/or timber supply is tight, competition tends to drive bid prices up over appraised values. Consistent overbid may be an indicator of excess demand.

6. **Requests for contract extensions.** Increases in the number of requests for timber contract extensions may signal declining timber demand.

7. **Recent or expected changes in Forest Service policy.** Changes in log export policies or utilization requirements, for example, may affect timber demand.

8. **Recent or expected changes in industry structure.** New mills (or mill closures) and changes in the types of products manufactured in the region may affect timber demand.

9. **Significant changes in consuming markets, such as Japan, or in competing regions, such as Canada, that were not anticipated when long term planning cycle projections were made.**

Monitoring

Although we cannot fully eliminate the uncertainty associated with looking into the future, by following a well-designed monitoring plan we can answer important management questions and gather the information necessary to improve the accuracy of our predictions. The procedures outlined in the previous pages have been designed to allow us to move forward with a timber sale program while the industry is in a complete structural transition. They provide a starting point for timber sale planning based on our current understanding of the industry in Southeast Alaska and its competitive position in wood product markets.

The strategy set forth in this paper is our first formal attempt to estimate the market demand for timber in the coming year and plan timber offerings accordingly. As the procedures are implemented we need to ask several questions to evaluate and, perhaps, improve upon our approach. Did we do what we said we were going to do? Did we accomplish what we thought we would accomplish? How can we improve our decision-making process? The monitoring plan described below was designed to answer these questions. It establishes a system of checkpoints for determining whether the procedures we have designed are, in fact, meeting the following objective:

> **Subject to appropriations, other applicable law, and the requirements of the National Forest Management Act, and to the extent consistent with the direction in the Tongass Land Management Plan---offer a volume of timber each year that: 1) allows existing mills to operate at a level consistent with market conditions; 2) provides for the opening of new timber processing facilities or expansion of existing facilities; and 3) will be purchased when offered.**

The monitoring plan has three primary roles. First, it provides answers to three management questions to help determine the effectiveness of the Region's approach to timber sale planning (Section I-Management Issues). Next, it explicitly addresses the assumptions about industry operations and markets and sets up a process to systematically collect the information needed to test and revise those assumptions (Section II-Validation of Models and Assumptions). Finally, it provides a complete listing of the information needed to improve upon our understanding of--and our ability to model--regional stumpage markets (Section III-Database Development.)

I. Management Issues

	Questions to be asked at the end of each year:	Indicator:	Follow-up action:
1.	*Was the timber supply made available last year in a timely fashion and at a level comparable to that suggested by the timber sale planning (TSP) model?*	Report the volume and date of timber sales offered each fiscal year. Compare offer volume to "suggested offer range" calculated in the TSP model.	**Document variation from "suggested offer", if any, and incorporate actual offer volume into future model calculations.**
2.	*Was there demand for the timber offered?*	Report the number, size, and appraised value of any sales offer that did not receive bids each fiscal year. Note factors that reduced marketability. For example, is the market saturated, or was the sale offered at a price the industry was unwilling to pay?	**Issue summary report of findings to management to use in future sale planning.**
3.	*Did the Tongass timber program level constrain the operation of existing mills or the opening of new wood processing facilities?*	Report the level of volume under contract at the close of each fiscal year. Note distribution of volume across purchasers.	**If VUC < the target buffer stock in the TSP model, ensure that timber offerings this year exceed projected harvest.**
		Review the bidding activity and accumulated volume under contract for buyers planning new facilities. Managers of planned facilities must begin bidding on timber sales and accumulating volume under contract. If they regularly bid on timber sales but are not acquiring timber, (and all timber is sold) the annual offer level may be a limiting factor.	**If the owners of planned new mills are actively bidding on timber sales, ensure that the new mill's capacity has been incorporated in the TSP model.**
		Report the number of bidders for each timber sale and the bid ratio (high bid/appraised value) for sales offered and sold each fiscal year.	When market conditions are good and/or timber supply is tight, competition tends to drive bid prices in excess of appraised prices. The number of bidders for each sale is also an indication of competition. High stumpage prices in poor markets are an indication of relative scarcity.

II. Validation of Models and Assumptions

	Assumptions in: Brooks, David J.; Haynes, Richard W. 1997. <u>Timber products output and timber harvests in Alaska: projections for 1997-2010,</u> PNW-GTR-409.	**Verification:**	**Criteria for Action:**
1a.	*"…Alaska mills cannot or will not compete for timber harvested from private land (Native Corporations) in Alaska." Brooks, 1997, pg. 4*	Use on-going discussions with mill owners, media, and informal communication channels to maintain general awareness of industry developments that may invalidate this assumption. Continue to look for better information sources regarding private timber harvest levels.	**If it can be documented that private timber supplies account for more than 20 percent of timber processed in the region, or if a wood processing facility is constructed primarily to manufacture timber from private lands, revise the ten-year harvest projections.**
2a.	*"…alternative markets, either export or domestic, can be developed for chips, low-grade saw logs, and utility grade logs. In the absence of markets, low-grade saw logs and utility logs may be left as logging residues." Brooks, 1997, pg. 4* *"…we assume that changes in policies or management practices (including harvesting practices) will enable this." Brooks, 1997, pg. 9* *"…all residues from lumber manufacturing can be marketed…" Brooks, 1997, pg. 7*	Verify actual end uses of small diameter sawlogs, utility volume, and sawmill by-products by monitoring industry investment in chipping and other methods of utilization. Maintain awareness of Region's policy on logging residue.	**In the event that another major product line emerges to utilize low-end material (i.e. pulp mill, ethanol facility, fiberboard plant, etc) revise the ten-year harvest projections.**
3a.	*"…15 to 35 percent of Alaska's lumber production will be shipped to U.S. domestic markets." Brooks, 1997, pg. 4*	Verify actual sales destinations for wood products sawn in Southeast Alaska each fiscal year. Continue to look for better information sources regarding the domestic sales of Southeast Alaska producers.	**If it can be documented that sales to domestic markets account for more than 35% of lumber production in Southeast Alaska, revise the ten-year harvest forecast.**
4a.	*"…overrun will increase by either as little as 10 percent (in the "low" scenario) or as much as 30 percent (in the "high" scenario) over the period 1997-2010…" Brooks, 1997, pg. 5*	Use on-going discussions with mill owners, media, and informal communication channels to maintain general awareness of industry developments that may indicate a faster or slower rate of change. On-going mill studies at the Pacific Northwest Research Station and the Forest Product Lab may provide further insight.	**Incorporate best available information when the ten-year harvest projections are revised.**

5a.	*"…lumber manufacturing is the primary industry in Southeast Alaska; the National Forest timber previously used for pulp is assumed to be surplus to the manufacturing requirements of Alaska mills…" Brooks, 1997, pg.9*	Verify actual product mix for Southeast Alaska mills. Contact larger mill owners for information.	The 10-year harvest projections assume that sawnwood production drives timber harvest. Softwood lumber market shares are a key factor in the projections. **If other products-- such as veneer or fiberboard--emerge, revise the ten-year forecast.**
6a.	*"North American producers as a whole are assumed to face continuing competition from other suppliers in the Japanese market; in none of the scenarios do we assume the possibility of a return to the market shares observed in the 1980's." Brooks, 1997, pg. 5* *North America will supply 70% to 72% of Japan's annual softwood lumber imports through the year 2002 (see Brooks, 1997, Table 3)*	Using data supplied by the Japan Wood Products Research Information Center, verify actual North American share of Japanese softwood lumber imports each year and compare with stated assumption.	The ten-year harvest projections are not especially sensitive to this variable. **Consider the need to revise the ten-year harvest forecasts if there is a significant variation (+/- 25%) from the stated assumption**
7a.	*"…producers in Alaska will face stiff competition from larger and generally more efficient producers in the Pacific Northwest and Canada." Brooks, 1997, pg. 15* *Alaska will supply 1.4% to 2.5% of North America's annual softwood lumber exports to Japan through the year 2002. (see Brooks, 1997, Table 3)*	Using data from the U.S. Department of Commerce and the Japan Wood Products Research Information Center, compare Alaska's actual share of North American shipments to the forecast.	**If Alaska's share of North America's annual softwood lumber exports to Japan exceeds 2.5% for two successive years, review the ten-year harvest forecast.**
8a.	*The Food and Agriculture Organization [FAO] 1997 has accurately projected future lumber consumption in Japan (see Brooks, 1997, pg.1).*	FAO will validate their projections and revise as necessary.	**As new estimates become available from FAO, revise the ten-year harvest forecast.**
	Assumptions in: <u>Evaluating the Demand for Tongass Timber</u>, USDA Forest Service, Region 10, 1998.	**Verification:**	**Action:**
1b.	*The buffer stock calculations accurately portray industry activity.*	Review volume under contract and the rate at which it is being harvested and replenished.	**Every three years, review trends in inventory management and revise model as necessary.**
2b.	*The installed and operable mill capacity reported in Table 1 is accurate and generally corresponds to the definition of capacity used in Table 4.*	Need to document installed capacity using a consistent definition.	**Revise as necessary when new information becomes available.**
3b.	*The rate of capacity utilization in the Pacific Northwest is characteristic of industry operations in Southeast Alaska.*	On-going question. Will depend upon our ability to address (Sec. II, 2b.) and to monitor actual production in Alaska mills (Sec. II, 1b.)	**Revise as necessary when new information becomes available.**

4b.	*The Tongass will continue to provide the bulk of timber processed in Southeast Alaska.*	Refer to (1a). Maintain awareness of timber supply and harvest from State timberlands.	**If it can be documented that timber supplies from non-Tongass ownership account are not accurately represented in the TSP model, make the necessary revisions.**
5b.	*Sixty-three percent of the timber volume sold is processed in sawmills.*	Refer to (2a) and (5a). Maintain awareness of changes to the Region's log export policy.	**Significant changes in the type of products manufactured, the extent to which low-end material is utilized, and policy and regulations pertaining to log exports and logging residue will require a revision of TSP model coefficients.**

III. Database Development

	Information to collect	**Current availability**	**Desired availability**
Tongass National Forest			
1a.	*<u>Timber sale data</u>: volume by species, appraised unit (per mbf) value, purchaser credit unit value, high bid unit value, number of bidders, SBA sale?, date offered/awarded. Include information about sales receiving no bids.*	Information for sales over $2,000 in value is collected on hard copies in the Regional Office. Hard copy 2400-17's are also available from the SOs.	Electronic database that can be queried to extract the information for a particular sale or sum across sales. Updated quarterly.
2a.	*<u>Timber harvested</u>: volume by species, unit price paid.*	Quarterly cut and sold reports available from Gene Miller.	No change recommended.
3a.	*<u>Log exports</u>: 1) permit applications granted, volume by species, purchaser, destination. 2) logs exported, volume by species, destination*	Log export permits are gathered in the Regional Office. Not systematically analyzed, although some information has been entered into a computer database.	Quarterly report of permits requested and granted. Annual report of logs exported. Analysis of export volume activity by purchaser and country of destination.
4a.	*<u>Volume under contract</u>: volume and value by purchaser*	Volume by purchaser reported annually by RO-FM. Time series data published annually in ANILCA 706(a) report.	Report value as well as volume to compute inventory carrying cost.
Industry Operations			
1b.	*Mills and mill capacity, product mix, production, wood source, employment, installed equipment.*	Basic information published annually in ANILCA 706(a) report.	Complete data set collected for each mill using the same questions and definitions of terms. Published annually.

2b.	*Logging costs in Southeast Alaska*	Calculated as part of timber appraisal process. Not systematically compiled or analyzed.	Annual review of logging costs and trends in individual cost centers. Special need for analysis of economics of alternatives to clearcutting.
3b.	*Timber offer and harvest on State and private timberlands in Southeast Alaska.*	Harvest estimates are calculated and published annually in the ANILCA 706(a) report.	Report offer as well as harvest for State timber program. Continue to look for better sources of information about timber program activities of Native Corporations.
Market Conditions and Trends			
1c.	*Projections of lumber consumption in Japan*	Not currently monitored in R10.	Review projections published by FAO.
2c.	*Housing starts in Japan (total vs. wood-based) and average floorspace by type*	Published annually in the ANILCA 706(a) report.	No change recommended.
3c.	*Japanese softwood lumber imports by source (volume and value)*	Published annually in the ANILCA 706(a) report.	No change recommended.
4c.	*B.C. lumber exports, volume and unit value by destination*	Not currently monitored in R10.	B.C. Ministry of Forests annual trade statistics
5c.	*U.S. lumber exports, volume and unit value by destination*	Not currently monitored in R10.	Review data collected and published by FAO.
6c.	*PNW lumber exports, volume by species, unit value and destination*	Published quarterly by PNW Research Station: "Production, Prices, Employment, and Trade in Northwest Forest Industries"	No change recommended.
7c.	*PNW lumber imports, volume by species, unit value and source*	Published quarterly by PNW Research Station: "Production, Prices, Employment, and Trade in Northwest Forest Industries"	No change recommended.
8c.	*PNW sawmill capacity by state*	WWPA mill surveys. Data available through PNW Research Station, as needed.	No change recommended.
9c.	*Chip prices on export and domestic markets.*	Export volumes and unit prices are published annually in the ANILCA 706(a) report.	Publish and monitor domestic chip and pulpwood unit prices as well as export.
10c.	*Alaska lumber exports, volume and unit value by destination*	Published annually in the ANILCA 706(a) report.	No change recommended.
11c.	*Alaska lumber shipments to U.S. domestic markets, volume and unit value*	Very rough estimates are published annually in the ANILCA 706(a) report.	Continue to try to find a reliable source for data on domestic sales.
12c.	*U.S. currency exchange rates in Canada, Japan, South Korea, and China*	Published annually in the ANILCA 706(a) report.	No change recommended.

13c.	*Gross domestic product, consumer price indices, and interest rates in the U.S., Canada, Scandinavia, Japan, Korea, Taiwan, and China*	Published annually in the ANILCA 706(a) report.	No change recommended.